ROCHESTER - OLMSTED COUNCIL OF GOVERNMENTS
2122 CAMPUS DRIVE SE
ROCHESTER MN. 55904-7996
PHONE (507) 285-8232
FAX (507) 287-2275

MEMORANDUM

TO: Rochester City Council / Committee of the Whole

FROM: Charles Reiter
Senior Transportation Planner

DATE: September 25, 2003

RE: ROCOG Circle Drive Traffic and Access Management Plan

BACKGROUND

In 2001 work was begun on an evaluation of current and future traffic operation characteristics of the Circle Drive corridor with the intent of developing a plan or approach for managing future access and intersection improvements. A consultant was hired to provide technical assistance in evaluating future traffic and access needs and how the traffic mobility of the corridor would be affected by continued growth in traffic and potential demand for additional access locations along the corridor. In 2002 the final technical analysis report was completed and submitted to staff. As time has permitted staff has been considering the information in the technical analysis with the idea of developing a policy guide and recommended improvement plans for responding to future access & traffic improvement requests along the corridor.

The framework that ROCOG has identified for putting the findings of the technical study into use is as follows:

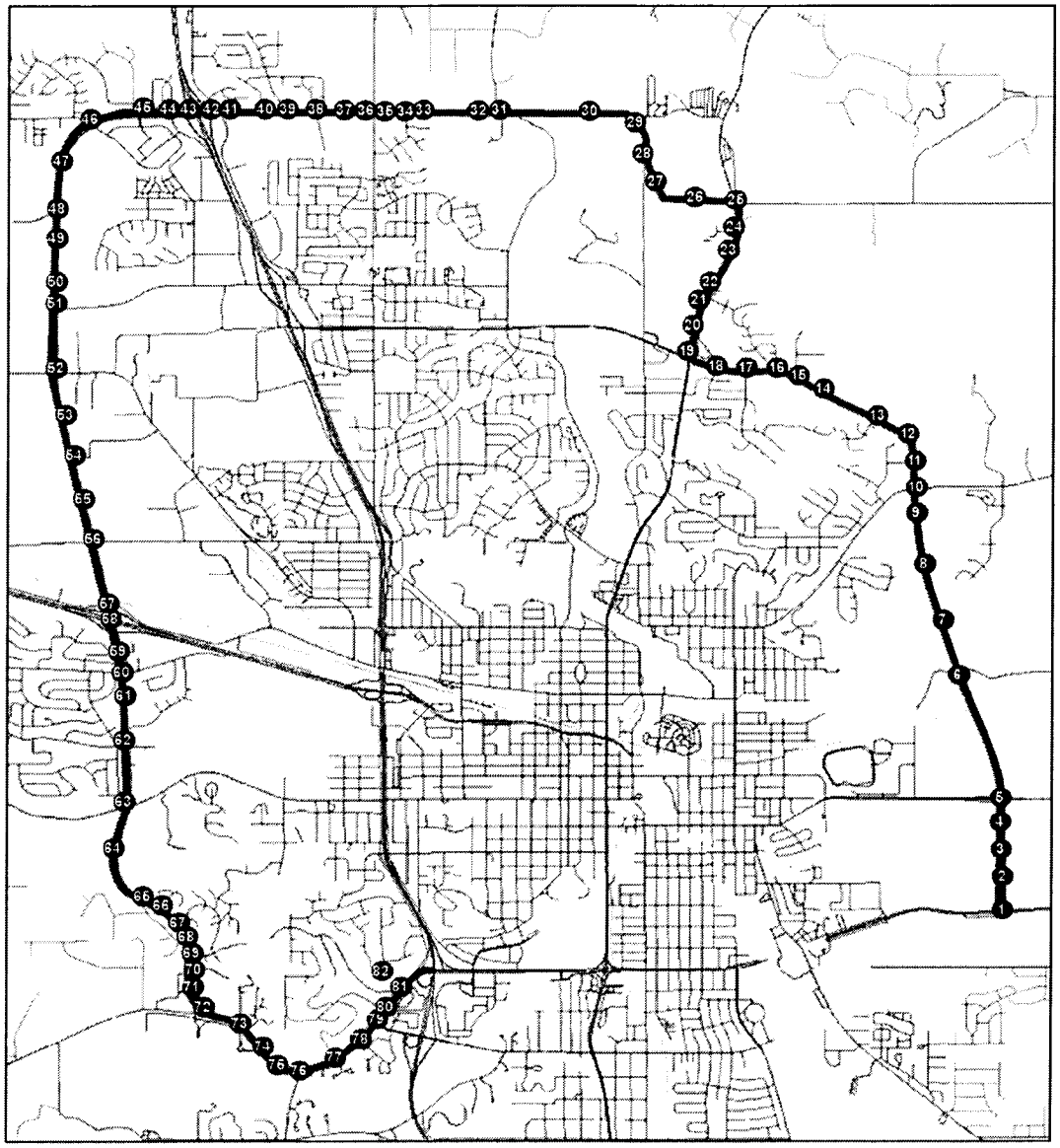
1) First, adopt general policy guidance suggested by the study that can be used in evaluating future requests for access or traffic improvements;

2) Recognize the improvement recommendations found in the Technical Study not as a final plan initially but as a guide to respond to requests for improvements and to development proposals on property adjacent to the corridor;

3) As time permits, work on the development of final segment level plans that will detail the ultimate improvements planned for each section of the corridor. This will involve meetings with landowners and development interests along each section of the corridor to work out solutions to issues consistent with the policy guidance adopted as part of #1;

4) Adopt and publish a final corridor level implementation plan that combines the work of the previous three steps to present a single source document to provide guidance in the future.

The following graphic illustrates the system that was studied. It looks at approximately 16 miles of roadway corridor which had 80 access openings at the time of construction. Currently 65 median openings are in use, with 7 having been closed, 6 yet to be developed and 2 not being used. This works out to an average of ~ 4 medians per mile or an average spacing of ¼ mile.



Circle Drive
TRAFFIC AND ACCESS MANAGEMENT PLAN

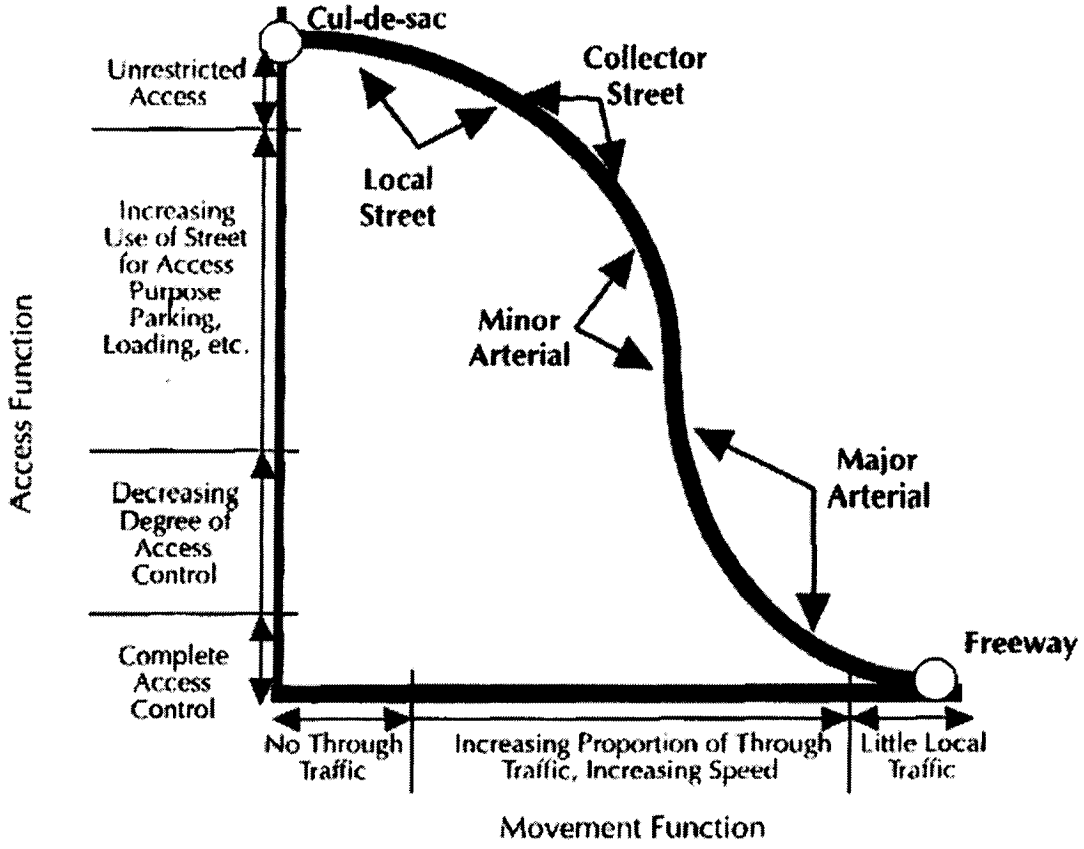
Figure 1

Intersection ID Numbers

Principles of Traffic Management

Before proceeding to review the proposed Policy Plan for the corridor, I think it is instructive to briefly review some of the principles of traffic management that have guided the study and analysis of this corridor. The basic principles are as follows:

1. The spacing of traffic signals governs the performance of a roadway corridor
2. Spacing guidelines should be keyed to roadway function and classification. Spacing should be more restrictive along strategic and principal arterials in order to provide needed capacity, to improve safety, and to improve traffic flow efficiency.



3. Operating speed is directly related to traffic signal spacing. Signal spacing criteria should take precedence over access along principal or strategic arterials.
4. Spacing needs to address the full range of intersecting facilities, including interchanges, signalized streets and driveways and unsignalized streets and driveways, as well as the design of median openings and corner clearances
5. Evenly spaced signals work best if a goal is to develop a progressive traffic flow system, and deviations from equal spacing distances should be minimized
6. Reasonable access to property must be available. However, this may involve access off of an intersecting street rather direct access.
7. The spacing of unsignalized access needs to consider acceleration and deceleration distances in relation to upstream and downstream streets and driveways
8. Conflict separation and minimizing the number of conflict points within conflict areas is essential to maintaining travel times, capacity and safety.

The following graphics highlight the relationship of access density to roadway operation. In the first graph, a comprehensive study done for MNDOT of many miles of roads throughout the state show increasing levels of accidents can be expected as the # of access per mile goes up.

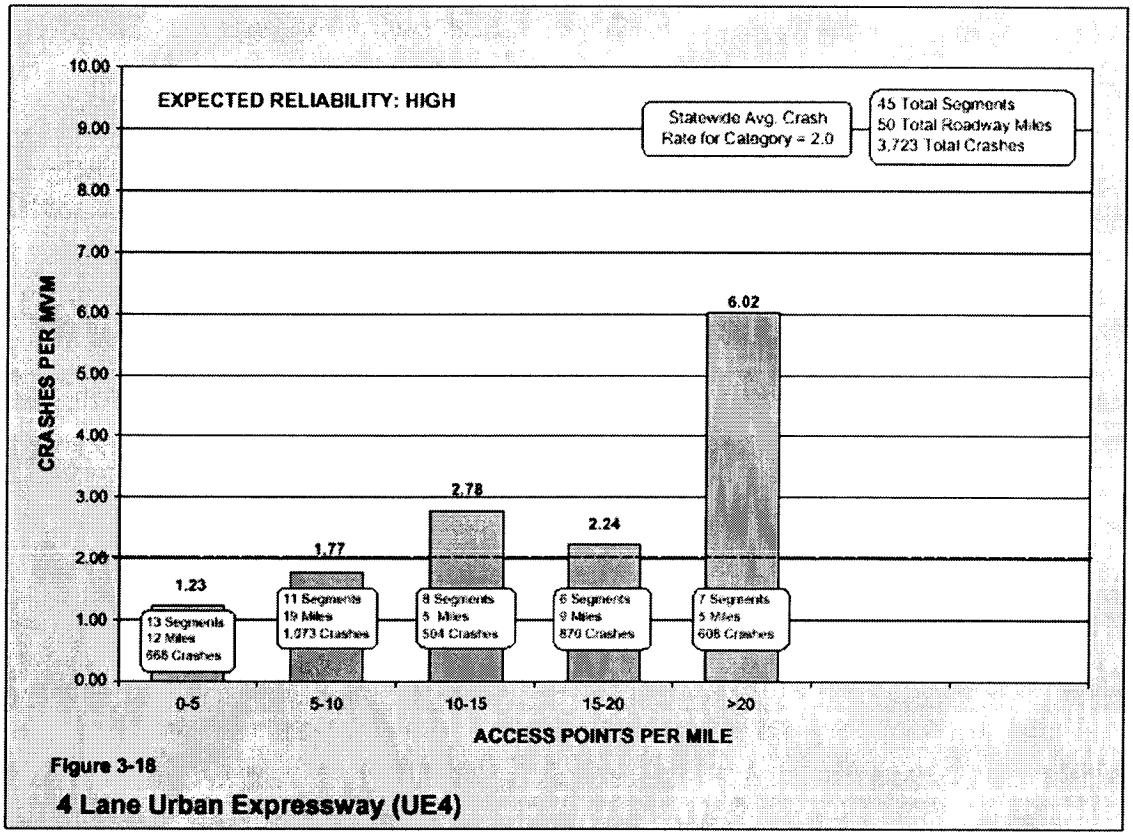
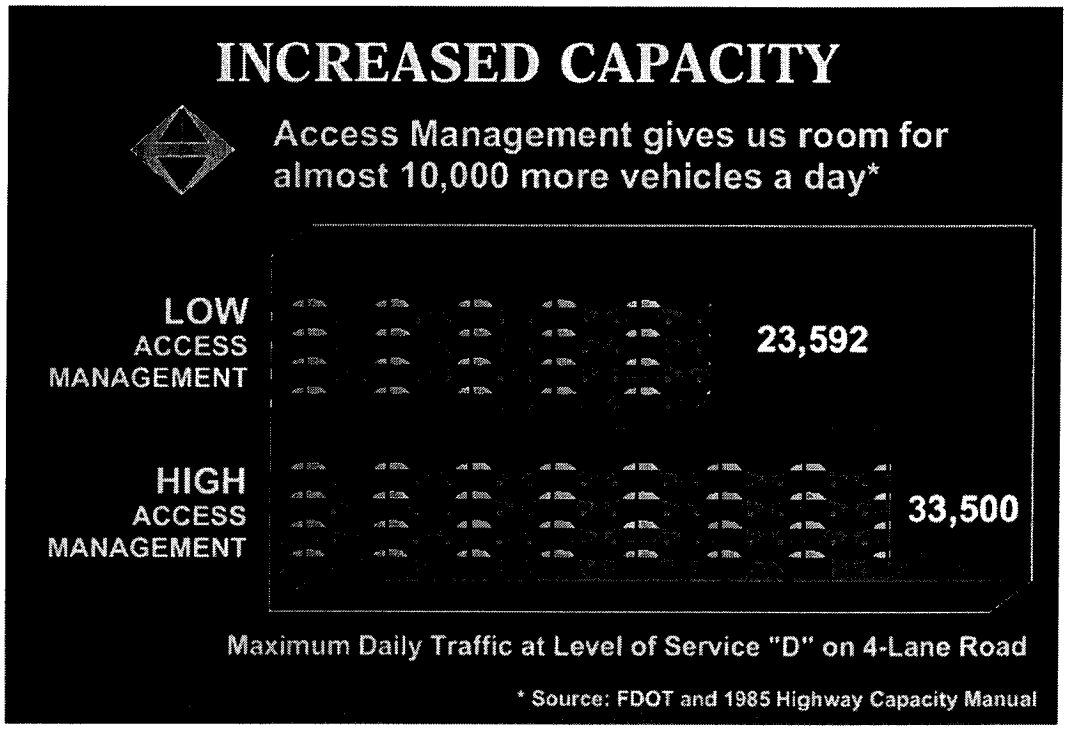


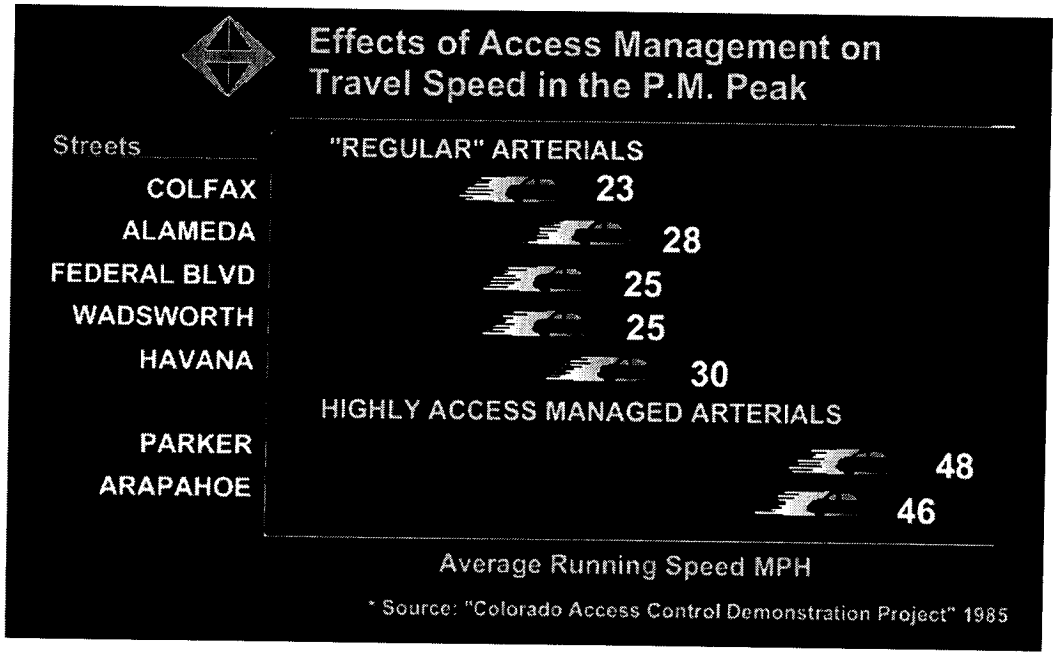
Figure 3-18
4 Lane Urban Expressway (UE4)

Studies conducted have also shown that managing access can also preserve capacity. In times of tight budgets, access management can be a cost effective way to extend the life of a roadway facility from a capacity standpoint.



Access and traffic management can also preserve the traffic mobility function of the corridor more effectively than alternative capital improvements. The graphic on the next page

illustrates results from a study in Colorado that have been supported by other projects and studies throughout the country.



Principles of Signal Spacing

Since the spacing of traffic signals is so important to how a corridor performs, it is important to understand some basic principles of signal spacing as well. These can be summarized as follows:

1. The spacing of signals is the single most important factor in setting what the maximum progression speed will be and how much of the green time at a signal will effectively serve a platoon a cars moving down the corridor (known as the "progression band")
2. Signal spacing should be considered that provides for the greatest flexibility and efficient traffic flow at different travel speeds, balancing the ability to handle high peak volumes as well as high off-peak travel speeds. Desirably, during off-peak conditions, the roadway will operate at 40-50 mph while in the peak hour 30 mph may be reasonable with sufficient capacity to meet the demand for traffic.

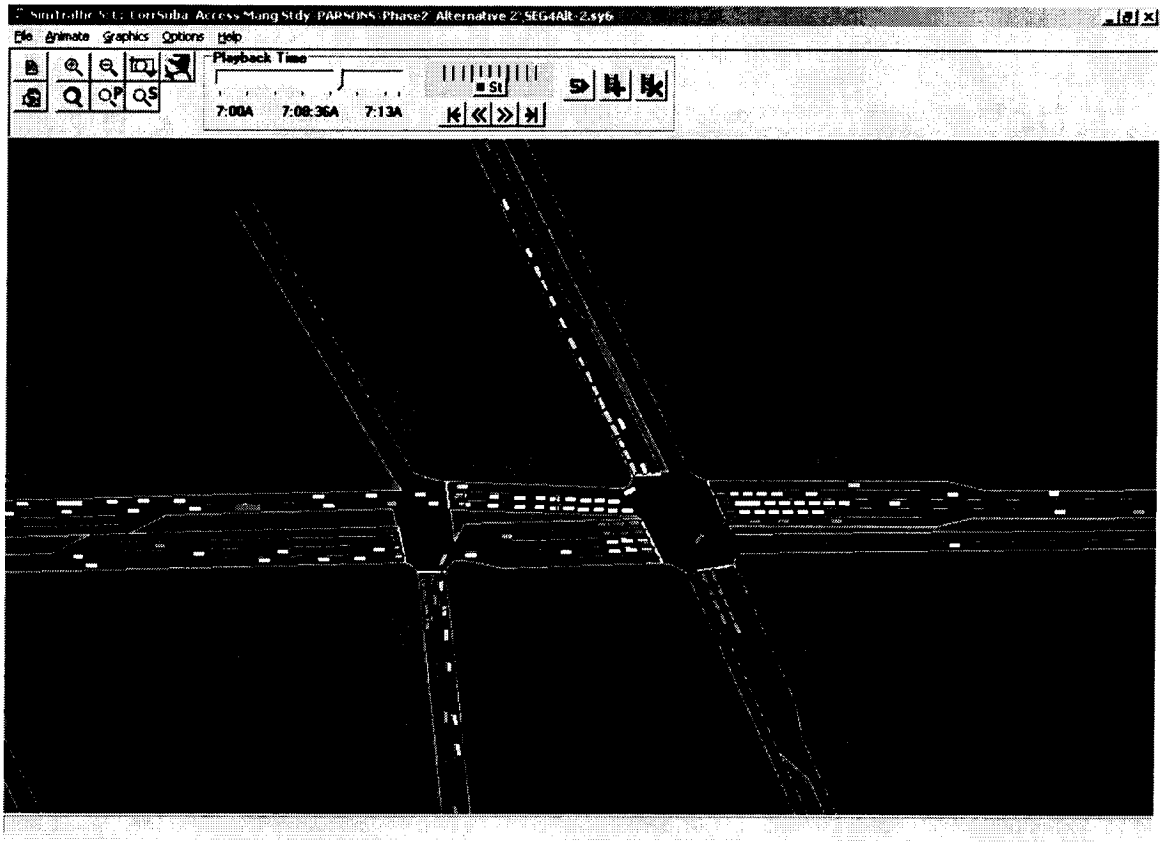
Progression can be achieved with spacing as short as ¼ mile, but only with short cycle lengths such as 60-70 seconds will the progression speed reach 30 mph. Short cycle lengths such as this, however, have so much lost time built in (yellow and red transition times) that they do not provide the capacity needed to meet peak hour demands, and as a result peak hour performance will typically fall to average travel speeds below 20 MPH with signals at ¼ mile.

½ mile spacing has generally been found to provide the range of flexibility needed to handle both peak and off-peak conditions in the most efficient manner. With the 120 second cycles typically needed in the peak hour for capacity, ½ mile can still provide up to 30 mph progression, while in the off-peak, using shorter 70-80 second cycles, it can provide 45-50 mph average travel speeds. Maximum flow rates and minimum fuel consumption and emissions are

normally achieved at on a system operating at about 40 MPH on average, and ½ mile spacing of signals has been found to provide the best balance of tradeoffs in achieving this.

TECHNICAL STUDY SUMMARY

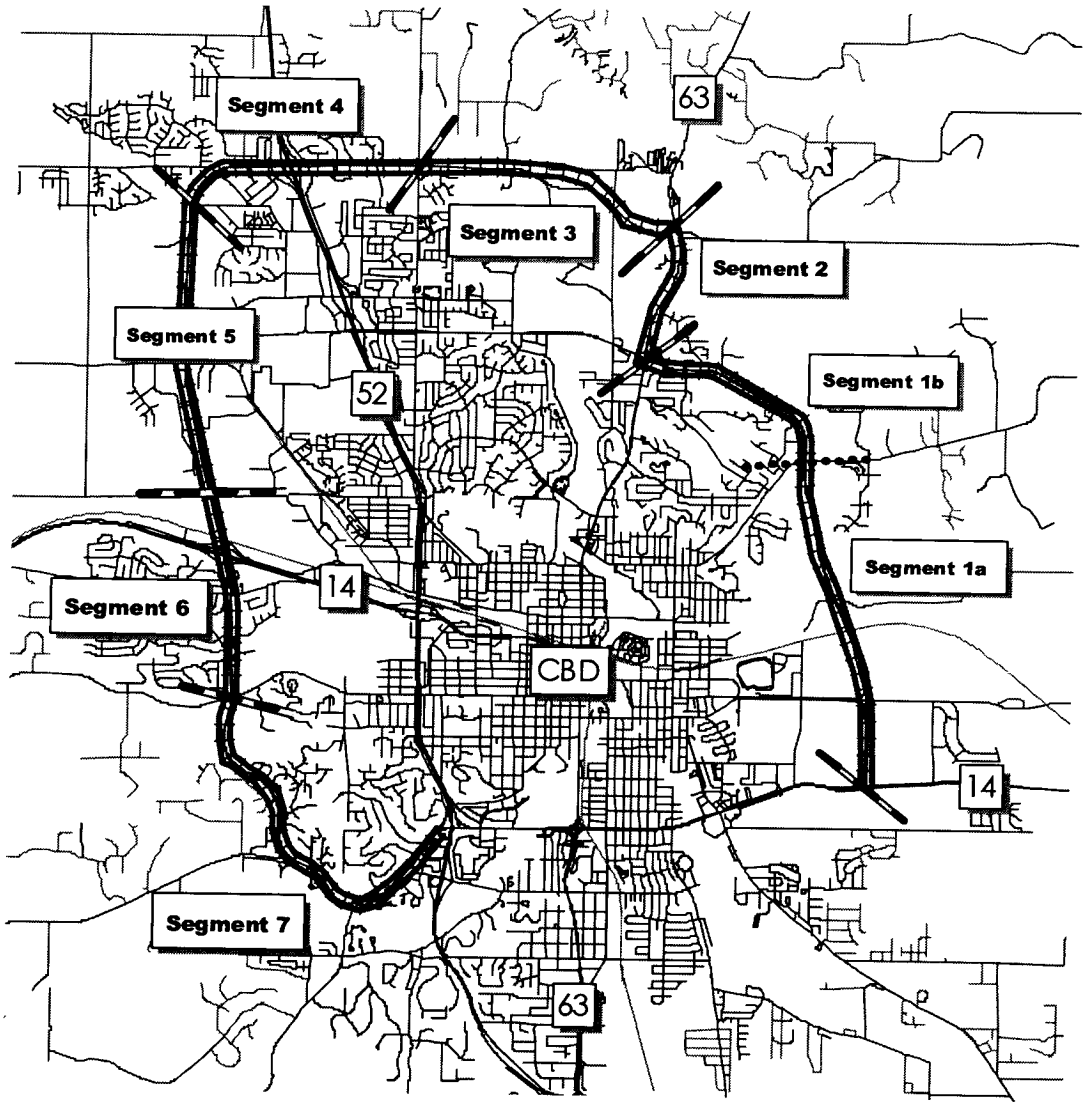
The technical study that was completed involved a range of tasks including the collection of existing traffic data, forecasting of future land use and peak hour traffic volumes, and technical analysis of traffic operation using standard traffic performance and simulation models to measure operating characteristics and future performance under projected traffic conditions. Below is a snapshot of the traffic simulation, which permits the viewing of simulated traffic operations as well as providing information on anticipated delay, congestion, travel speeds and



other measures which permit us to compare alternatives

For the purposes of the study the corridor was broken into seven analysis segments shown on the next page with the goal of identifying strategies within each segment for achieving the following performance objectives:

1. Average Travel Speeds of 40 MPH across the segment
2. Maximize Traffic Progression
    - Desirably 35-40% of the mainline green time would fit within the progression band
3. Manage traffic movements at signalized intersections with reasonable cycle lengths
    - 120 seconds is the preferred maximum length of signal cycles
4. Maintain a reasonable level side street traffic delay at all intersections
    - Average vehicle delay should be less than one cycle length for side street traffic



One reason the corridor was broken into segments for evaluation is that we found that there are critical points where traffic volumes, particularly turning volumes, are so heavy that it would be impossible to maintain a high level of progression through these locations, and thus we chose to use these locations as anchor points for the end of segments. These locations included the TH 14 West interchange, the TH 52 North interchange, the intersection of North Broadway and East Circle Drive, and the intersection of Viola Road and East Circle Drive. Other distinctions were made based on the character of development and design of the corridor (for example, we differentiated segment 6 from 7 based on these factors.

In the study we went through up to three iterations evaluating different types of improvements in each segment in an effort to identify what kinds of improvements would need to be considered. The types of improvement options considered included:

- Physical design –
    1. Turn lanes
        - For Left turn lanes we considered
            - Different number of turn lanes (single vs dual)

        - Restriction on side street left turn movements
    - For Right turn lanes we considered
        - Need for deceleration and acceleration lanes
        - In high volume locations, linking adjacent intersections with a third continuous lane for acceleration and deceleration
- Local Street System design
    1. local street system interconnections where considered for redirecting access traffic to preferred signal or median locations
- Signal operations
    1. different styles of timing patterns where considered to maximize efficiency of itnersections
    2. the spacing of signals relative to segment performance was considered
- Alternatives to left turns
    1. Utilization of right turn out / u-turns in lieu of left turns as a means to minimize signalization needs.

FINDINGS OF THE TECHNICAL ANALYSIS

The technical analysis results are summarized broadly on page 9 in terms of a comparison of the "2025 No-Build" versus an enhanced corridor plan that included additional turn lanes, access restrictions and local street system improvements. As you can see from that table significant improvements in average travel speeds and progression width were achieved under alternative plan concepts. The concepts used for the final iteration of analysis are illustrated in the pictures attached at the end of the report.

Recommended Policy Goals and Implementation Concepts

Based on the results of the technical evaluation and applying the principles of traffic management and signal spacing, a set of general policy guidelines were prepared for consideration. The Policy Guide begins on Page 10. ROCOG reviewed and endorsed this policy guide on September 25. As noted on page 1, there is a subsequent follow-up stage to this work that will required more detailed consideration of the plan for each segment in consultation with landowners, development interests and the road authorities. There are some questions or issues in each segment that will require review. However, by adopting the General Policy Guidelines presented herein there will be a framework in place as a starting point for considering these issues.

Table 1: Summary of Performance Evaluation

SEGMENT	*SECTION*	*2025 NO-BUILD NB/WB SPEED*	*2025 NO-BUILD SB/EB SPEED*	*2025 NO-BUILD PROG. BAND*	*2025 BUILD NB/WB SPEED*	*2025 BUILD SB/EB SPEED*	*2025 BUILD PROG. BAND*
1A	TH 14 TO CSAH 2	39	39	25%	41	40	36%
1B	CSAH 2 TO TH 63	34	32	17%	37	39	31%

Build Level of Service < D: Unsignalized – 2* / 9 / 14 / 16 / 18*
Dual Lefts: 10 / 19

2	37TH St to 55th St	26	34	28%	41	35	26%

Build Level of Service < D: Unsignalized – 20* / 21*

3	TH 63 to 18th Ave NW	32	31	13%	36	38	28%

Dual Lefts: 31 /

4	18TH Ave to 48th St NW	19	20	8%	27	26	20%

Build Level of Service < D: Unsignalized – 38 /
Dual Lefts: 41 / 42 / 43 / 46

5	48th St to 19th St NW	25	17	6%	28	30	23%

Build Level of Service < D: Unsignalized – 48 / 55*
Dual Lefts: 49 / 51 / 52 / 56

6	19th St NW - 2nd St SW	22	24	9%	25	28	31%

Build Level of Service < D: Unsignalized – None; SIGNALIZED: Intersection 57
Dual Lefts: 57 / 60 /

7	2nd St to TH 52	36	37	22%	39	39	38%

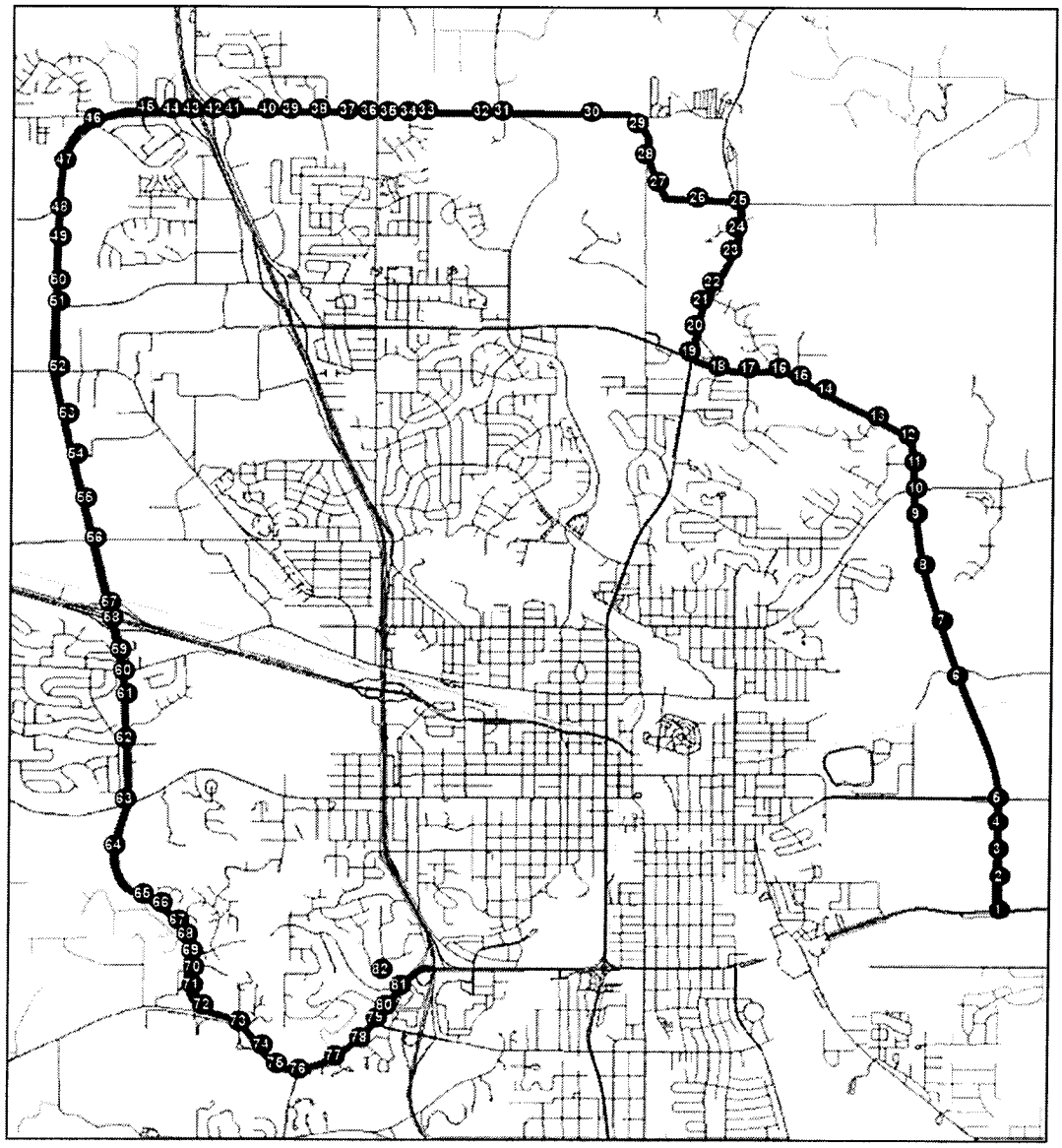
Build Level of Service < D: Unsignalized – 64 / 65 / 68 / 69 / 70 / 71 / 73 / 74 / 77 / 78 / 80*
Dual Lefts: 72 / 76 / 79

CIRCLE DRIVE TRAFFIC AND ACCESS MANAGEMENT POLICY GUIDE

Management Principles and Implementation Concepts

A. PREFACE

The intent of this policy guide is to provide interim guidance on the implementation of traffic management and access improvements along the Circle Drive Corridor illustrated in Figure 1 until such time as specific improvement plans for sections of the corridor are developed and adopted.



Circle Drive
TRAFFIC AND ACCESS MANAGEMENT PLAN

Figure 1

Intersection ID Numbers

The purpose of these principles and concepts is to provide a guide to decisions regarding traffic and access improvements that will preserve the function of Circle Drive as a major regional traffic corridor with a high level of safety, capacity and mobility. The principles and concepts should also contribute to structuring the layout of lands lying adjacent to the corridor in a manner that supports the function of Circle Drive. Implementation of these principles and concepts should aid in the preservation of the substantial public investment that has been made in the Circle Drive corridor and reduce the need for expensive remedial measures in the future.

The principal factors that are considered in the management of traffic and access to preserve the quality of traffic flow, capacity and safety are:

1. The spacing and design of street and private access intersections
2. The spacing and design of medians and median crossovers
3. The spacing of traffic signals and the design of signalized intersections

To achieve the safest and most efficient traffic flow, uniform or near uniform spacing of traffic signals is desirable. In planning for corridor level traffic management, it is desirable to select the preferred locations of traffic signals first, with existing or future unsignalized intersections managed through design to restrict the need for future signal installation. The spacing of signals should be related to desired operating speeds for the corridor. The local street system on lands abutting the corridor should be planned to facilitate the interconnection of adjacent lands such that local area traffic has alternatives to using Circle Drive and access to signalized intersections is available to all local motorists.

When the right of way for Circle Drive was acquired and during the construction of the corridor, predetermined access locations (a location of access reserved for the adjacent property at the time access rights were required) were established. These access locations are entitled to right-in, right-out access to the mainline of Circle Drive. The opening or closure of median crossovers associated with these access locations will be managed by the road authority to achieve desired levels of mobility and traffic progression. Decisions regarding the signalization, restriction or closure of median crossovers should be made consistent with the principles and concepts identified in this Policy Guide to achieve the highest reasonable level of traffic progression, safety and efficiency.

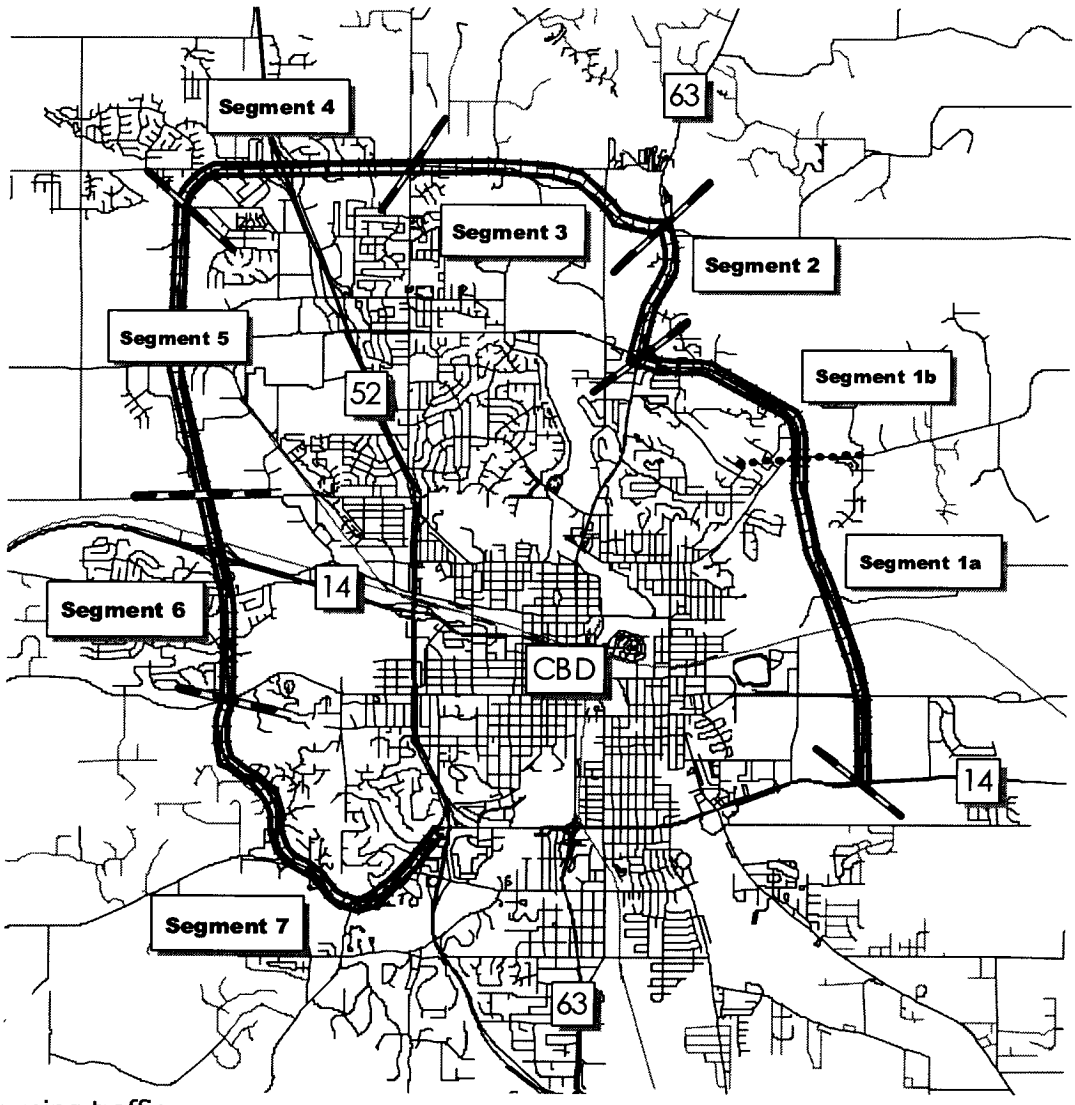
Determining solutions in advance of significant changes in conditions such as traffic volumes is desirable to avoid the higher costs associated with future retrofitting. Application of the following principles and concepts are endorsed as a guide to achieve the purposes and intent of this Policy Guide.

B. MANAGEMENT PRINCIPLES AND IMPLEMENTATION CONCEPTS

i. General Principles for Corridor Management on Circle Drive

1. The desired target for average operating speeds in segments of the corridor is 40-45 MPH. For the purposes of these policies, the corridor is divided into seven segments as illustrated in Figure 2. At the high volume intersections or at interchanges that form anchor locations for the ends of segments, traffic should be managed achieve the highest feasible level of safety

and efficiency given the presence of multiple signals within short distances or heavy volumes



of turning traffic.

2. The desired target for signalized intersections cycle length is no longer than 120 seconds (2 minutes). Achieving this will likely require a commitment over time to capital improvements including construction of dual left turn lanes or mainline auxiliary lanes that will provide for three lanes of traffic on short sections of the corridor between adjacent high volume intersections in order to provide adequate capacity .

3. The desired target for the progression band within segments of the corridor between anchor locations is 35% or greater. Generally speaking, this means an effort will be made to manage the operation of the signal system to make available a minimum of 35% of the mainline green time at any given traffic signal to serve a platoon of traffic moving through a segment of the corridor.

4. Side street traffic delay should be managed to provide acceptable levels of delay at both signalized and unsignalized intersections and access points. For intersections or accesses that

are planned to be unsignalized, this may require a combination of actions including median crossover restrictions combined with the provision of alternative traffic routes to provide local access to the nearest signalized intersections.

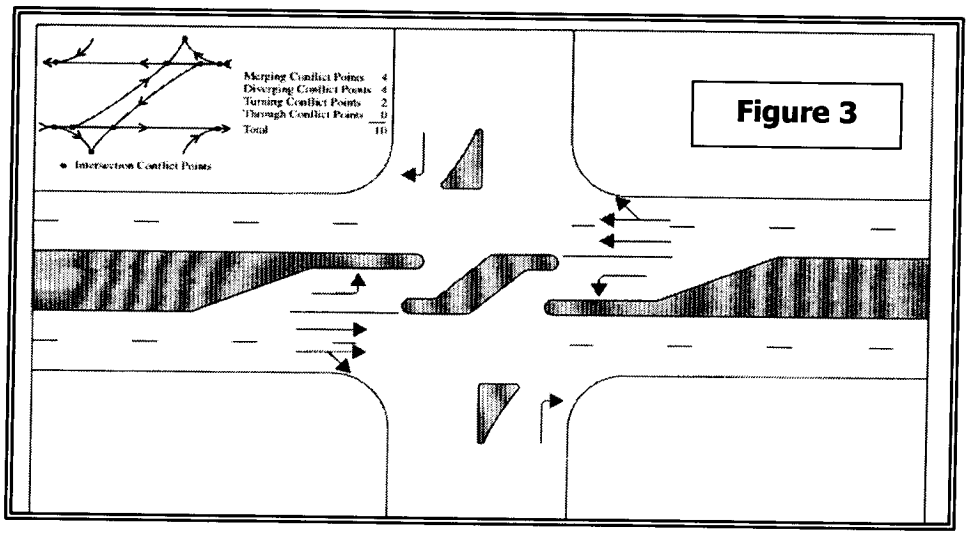
(ii) General Implementation Concepts

1. To achieve the General Principles for Corridor Management listed in Section B(i), the target for spacing between full access signalized intersections should be ½ mile within individual segments of the Circle Drive corridor. Limited signalization at spacing of approximately ½ mile will provide the greatest level of flexibility in implementing timing plans that can handle a range of traffic conditions. Figures 6 and 7 in the Technical Report[1] indicate intersections anticipated to be signalized under the recommended management plan.

2. The street system for the area shall be designed so that the median crossovers that will serve as the location for future traffic signals will be used as connections for public streets that are above the classification of a local or major local street, or that serve major private land development that will generate traffic volumes comparable to higher volume collector or arterial streets (> 5000 vehicles per day).

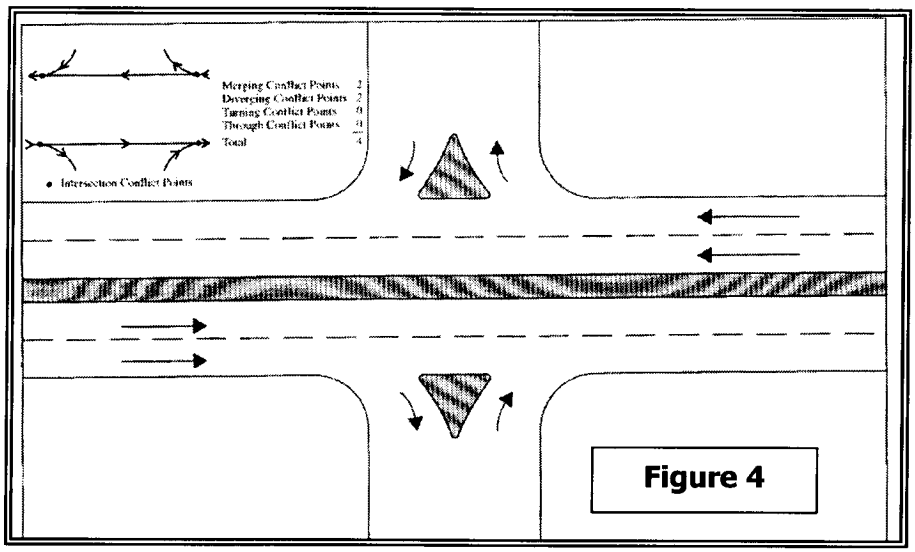
3. Median crossovers that were constructed to serve existing access openings that are planned to remain unsignalized may be controlled in the future to limit traffic movements for safety or congestion reasons according to the following principles:

    a. If there are demonstrated safety problems at the intersection or unacceptable traffic operations develop (defined as the Level of Service (LOS) for approach traffic on intersecting streets dropping below a LOS D or total peak hour delay exceeding 4 vehicle hours of delay[2], left turn traffic will be controlled through use of ¾ access design as illustrated in Figure 3



[1] Circle Drive Traffic and Access Management Study, Phase II Technical Report et al

[2] Recommended standards for unacceptable traffic operations are based on information in NCHRP Report 457, Evaluating Intersection Improvements: An Engineering Study Guide, Transportation Research Board, pp 38-39.



b. If the ¾ access design does not solve crash and congestion problems the next level of access control would be to convert the median crossover to Right In / Right-Out operation only, as illustrated in Figure 4 .

4. Access openings that have not been developed at locations where the associated median crossover is not planned for future signalization should be planned for improvement with the understanding partial access restrictions will be implemented consistent with the principles in #3 above. Local street system connections should be made that will facilitate the distribution of traffic from lands served by the access opening to adjacent access locations that are planned for signalization in the future.

   Efforts should be made to avoid limiting access for a property to a single planned unsignalized access unless absolutely constrained by physical topography. In such cases an overall limit on trip generation may need to be considered to insure the long term integrity of operations on Circle Drive, or the utilization of outbound right turns combined with U-turns in lieu of outbound left turns onto Circle Drive considered.

5. Access locations associated with future signalized median crossovers should serve as many property interests as possible to reduce the need for additional signalization of adjacent median crossovers and to eliminate the need for additional direct access to the corridor. Local street system connectivity should be provided to allow for the dispersal of traffic and to eliminate the need to use Circle Drive for short distance local area trips, and to insure all local lands have access to planned signalized median openings.

(iii) *Intersection Design Principles*

1. At all access points along the corridor right and left turn deceleration lanes will be required, with construction or accommodations made for the future construction of second left turns where a need for dual left turn lanes is anticipated in the future.

2. Right turn acceleration lanes should be provided wherever projected peak hour right turning volume is greater 10 vph

3. Left turn acceleration lanes may be required at unsignalized intersections if a significant volume is expected and the lane will not interfere with upstream left turn deceleration lanes

4. Sufficient queue capacity should be provided for traffic turning left off the corridor, and adequate corner clearance should be provided to insure traffic turning left onto the corridor will not interfere with traffic operations on intersecting streets. The concept of corner clearance is illustrated in Figure 5. Corner clearances guidelines are:

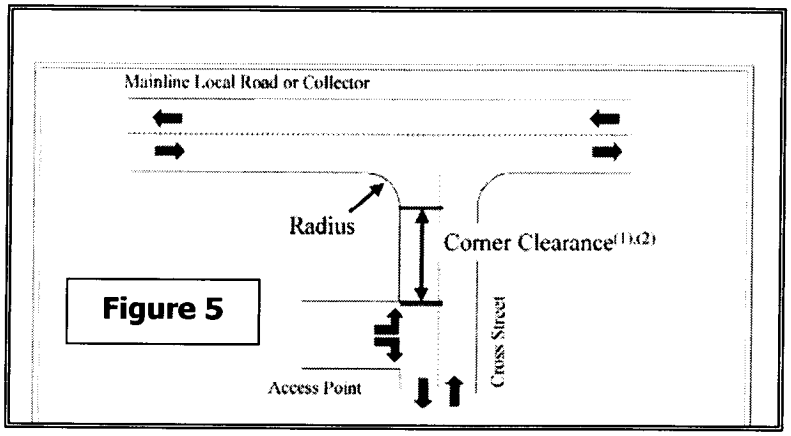


Figure 5

Arterial Cross Streets:

- 480 feet where left turn lanes are not required on an arterial cross street
- 660 feet where left turn lanes are required on the arterial cross street

Collector Cross Streets:

- 250 feet where left turn lanes are not required on a collector cross street
- 480 feet where turn lanes are required on a collector cross street

Local Non-Residential Streets:

- 250 feet

Local Residential Streets:

- 125 feet

5. Signalized "T" intersections treatments have the potential to provide for the management of high volumes on single approaches without major disruption to mainline flow through the use of a half-signal design. This can be considered as an option where there is a high volume commercial access on one side of the corridor with low volume on no access across the

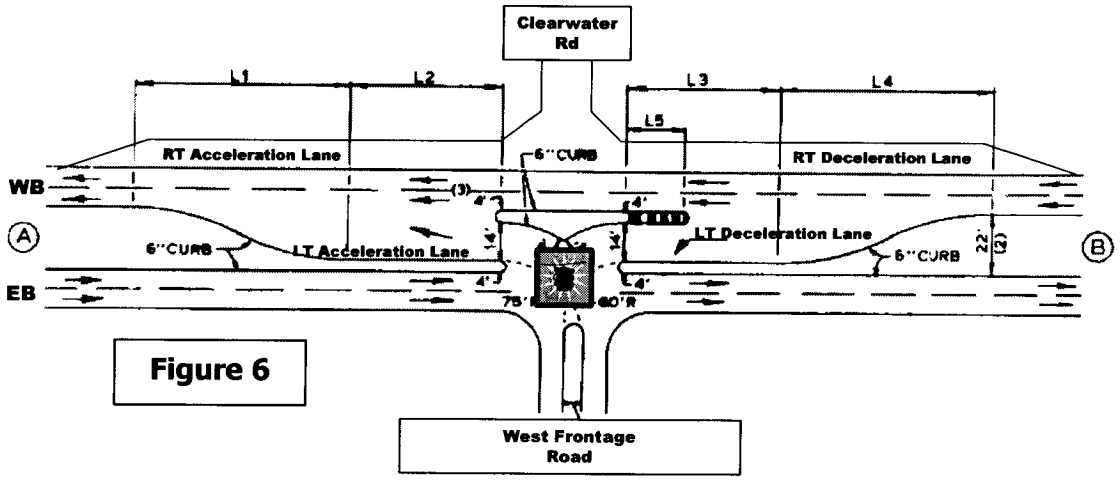


Figure 6

corridor. Figure 6 illustrates an example of this type of intersection.

6. To maximize the throughput of intersections and in areas where closely spaced signals exist, efforts should be made to install signal coordination systems linking together adjacent signals to permit the application of coordinated timing patterns, and the use of alternative timing patterns such as lead-lag phasing or right turn overlap should be considered.

Exception Process

1. Proposals for full access or signalization that are inconsistent with the principles and concepts identified in this Policy Guide shall not be permitted unless a report is prepared that convincingly documents there are no other reasonable alternatives available to full access or signalization, there is a documented necessity for full signalized operation at the location, and the corridor operating speeds, signal cycle length and progression bandwidth goals will be acheived.

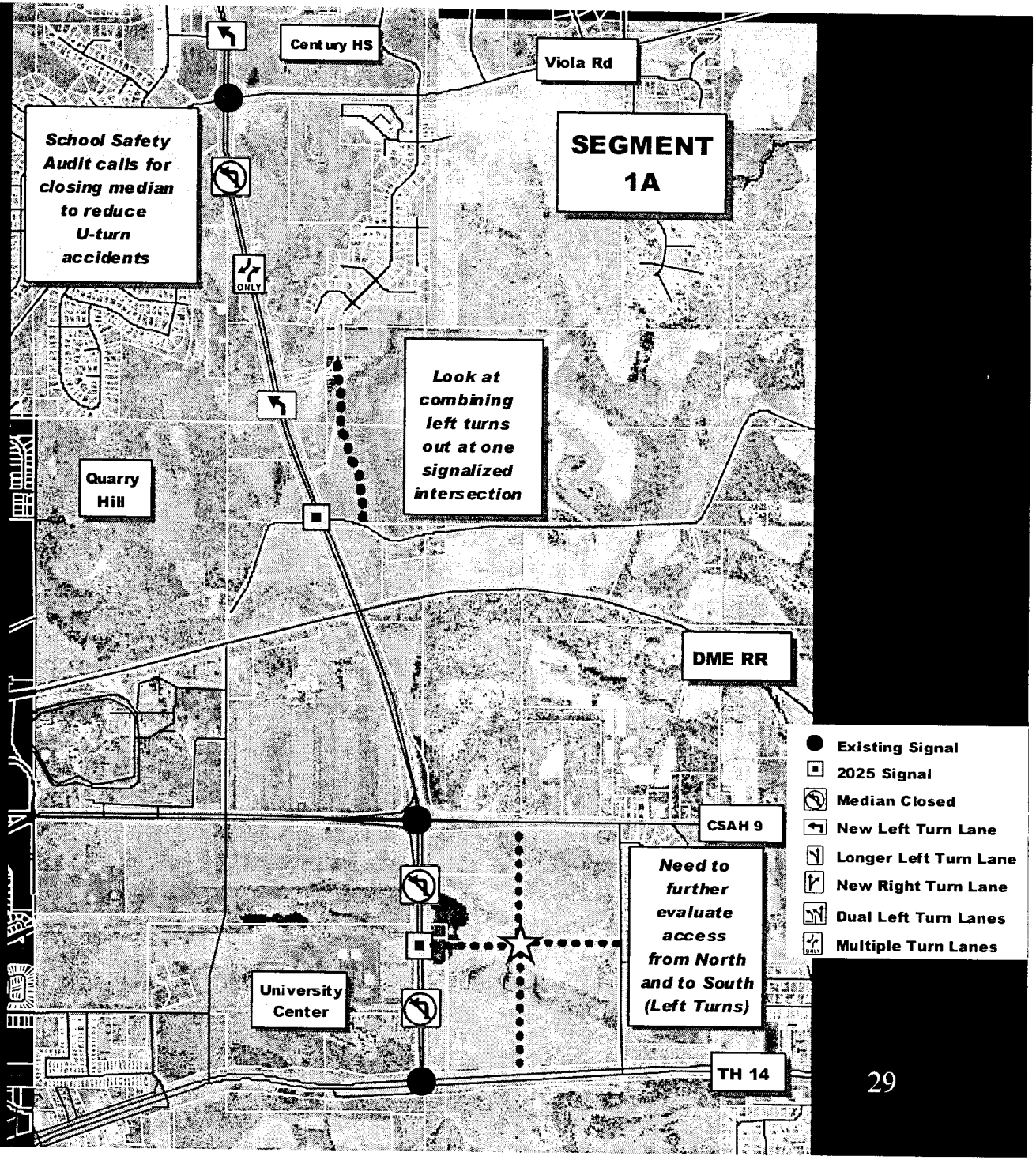
   Deviations in signal spacing from the locations identified as preferred locations in the Technical Report[3] may be considered where, due to consideration of topography, established property ownerships, unique physical limitations or unavoidable or pre-existing land use patterns, the desirable spacing should be modified

[3] Circle Drive Traffic and Access Management Plan Phase II Technical Report, January 2002, prepared for the Rochester-Olmsted Council of Governments by Parsons Transportation Group

Circle Drive
ACCESS MANAGEMENT PLAN

Segment 1A
2025 Phase III

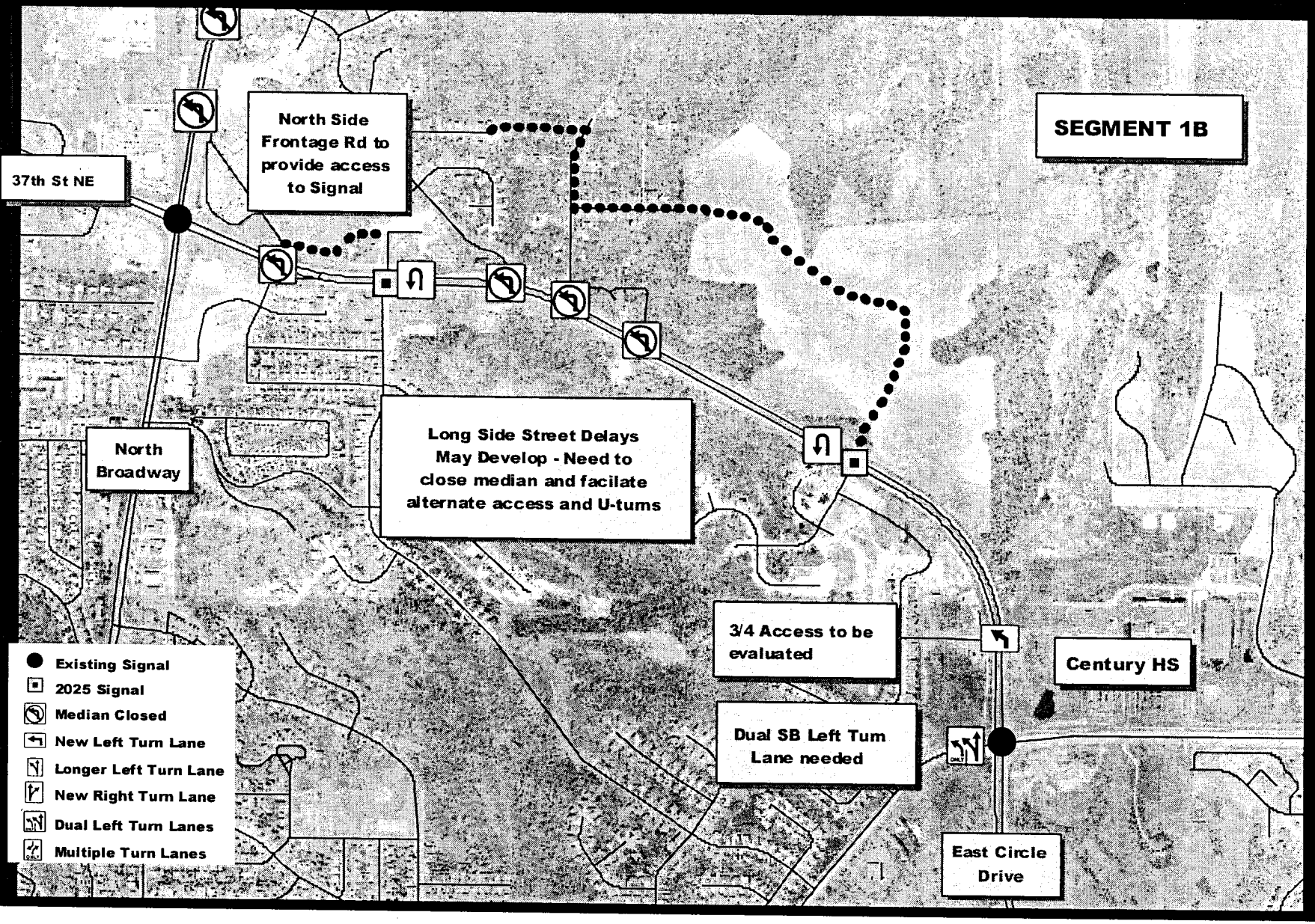
System Options and Other improvements



Circle Drive
ACCESS MANAGEMENT PLAN

Segment 1B

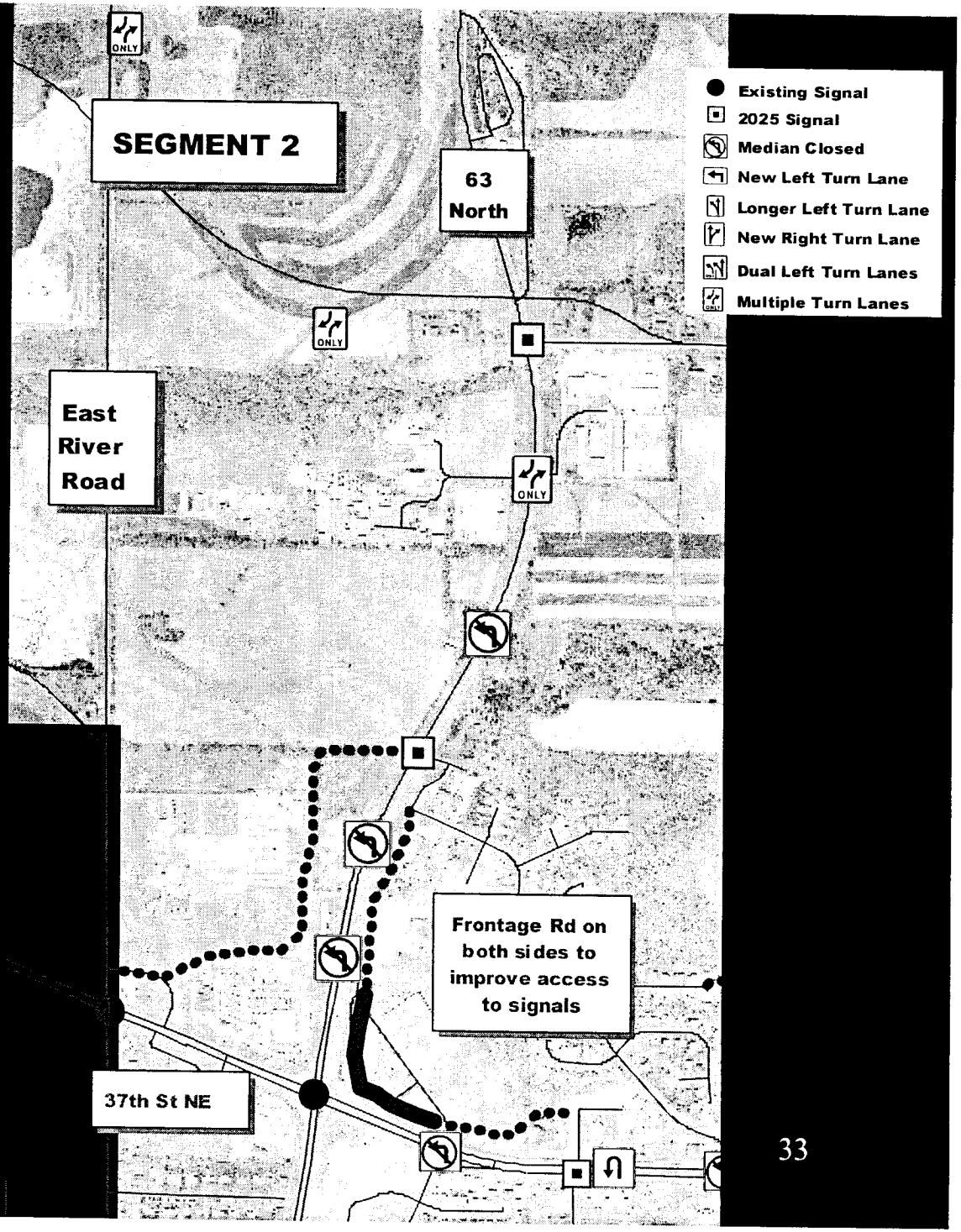
Alternatives for further Evaluation



Circle Drive
ACCESS MANAGEMENT PLAN

Segment 2

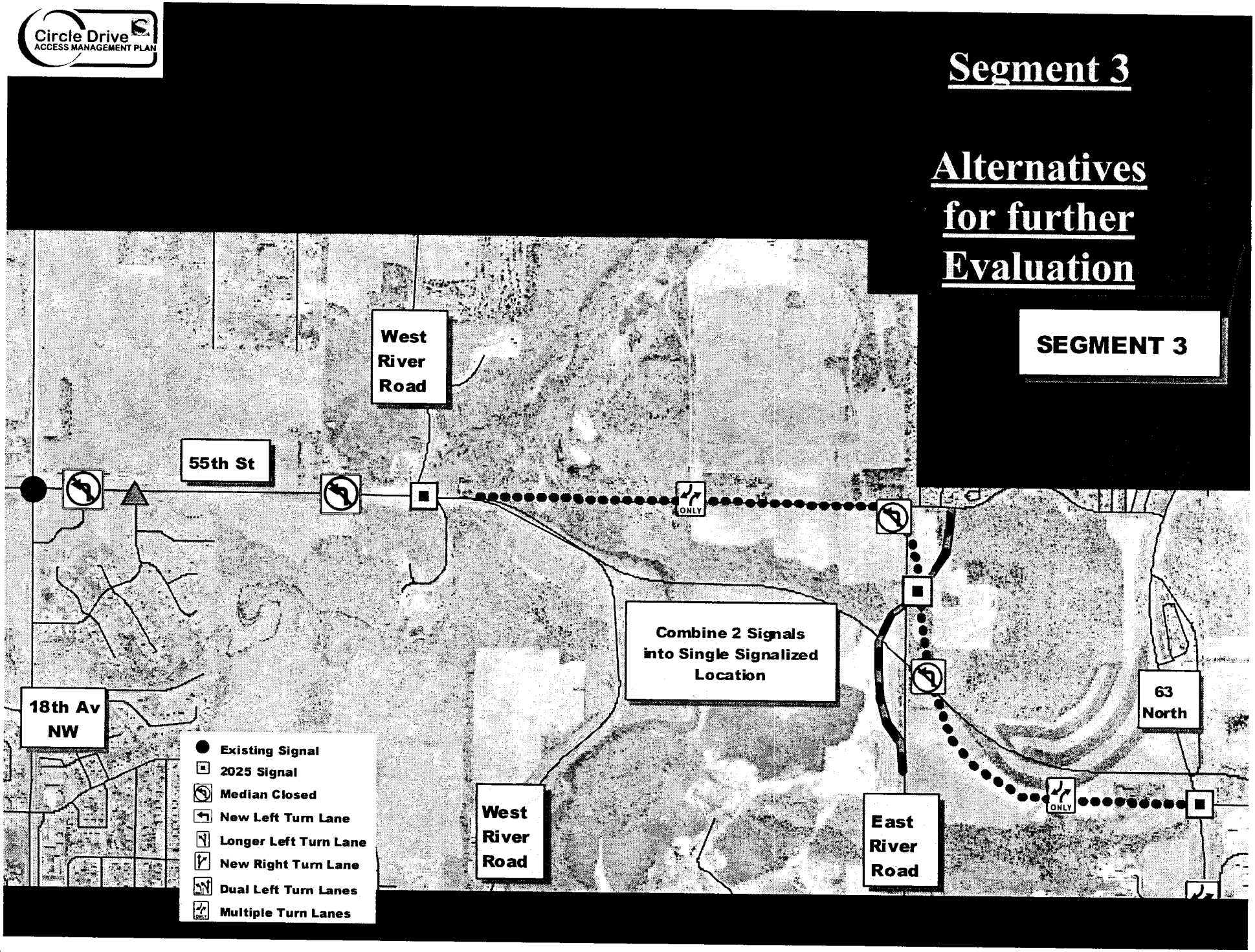
Alternatives for further Evaluation



Circle Drive
ACCESS MANAGEMENT PLAN

Segment 3

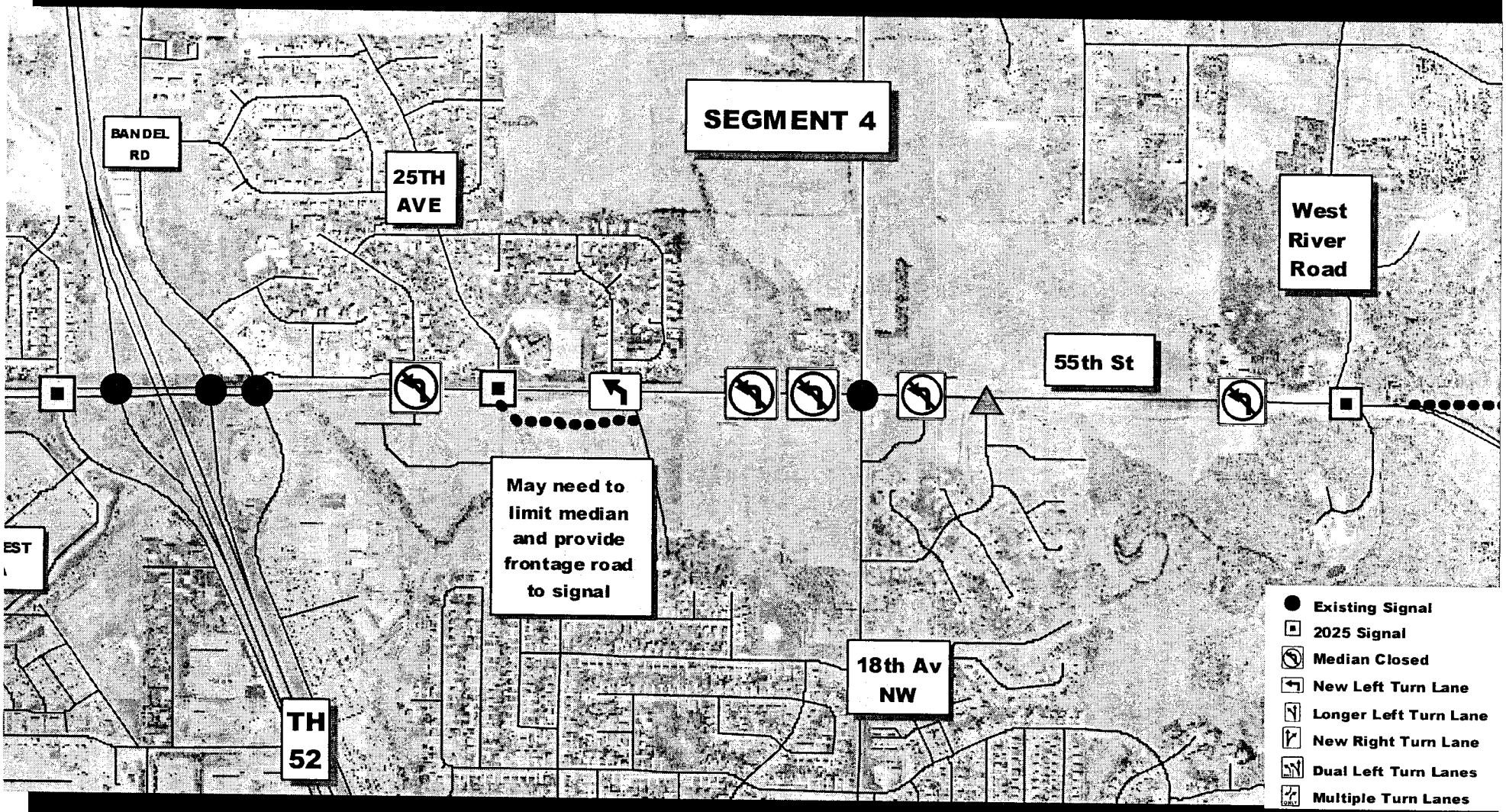
Alternatives for further Evaluation

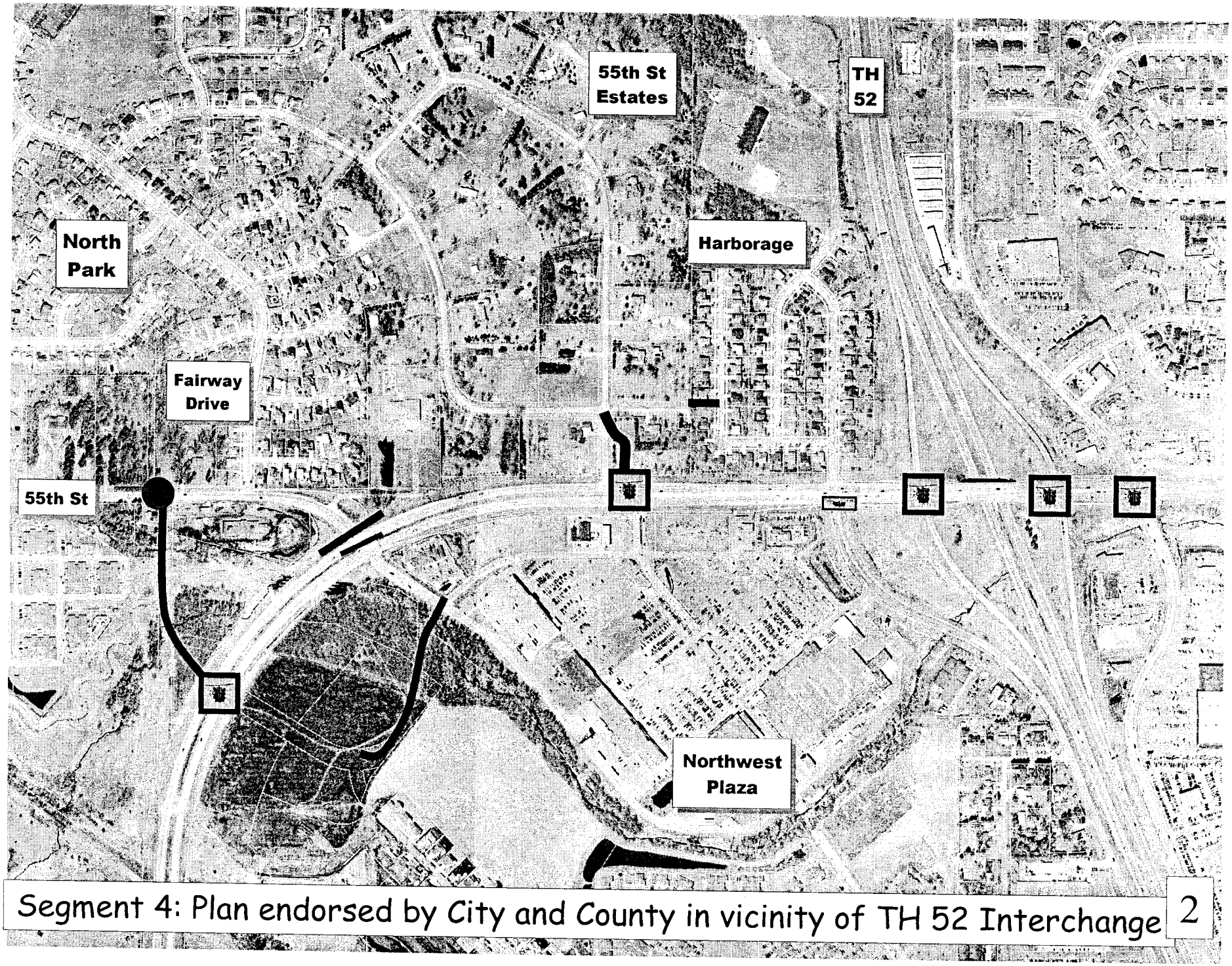


Circle Drive
ACCESS MANAGEMENT PLAN

Segment 4

Alternatives for further Evaluation east of Interchange





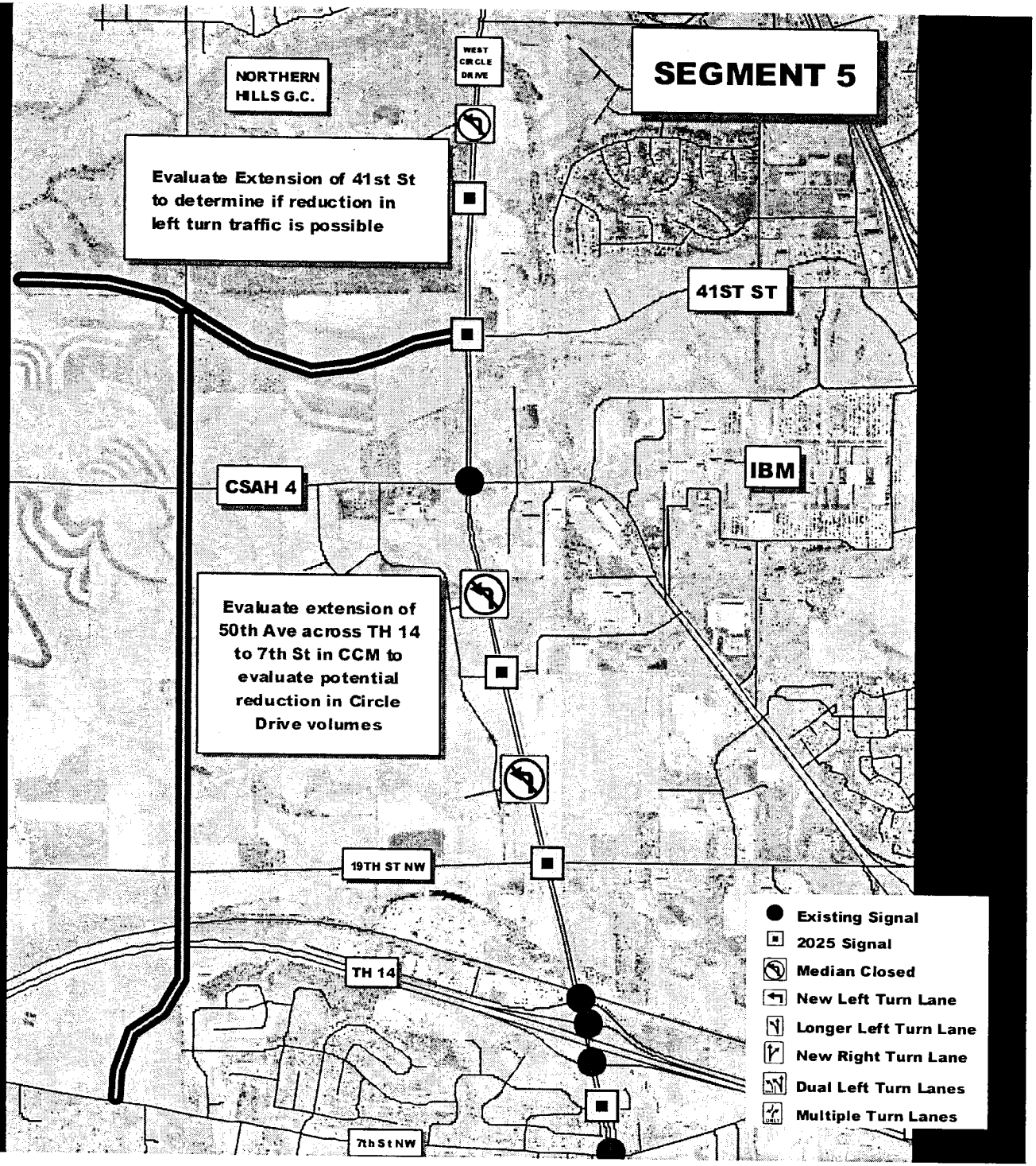
Segment 4: Plan endorsed by City and County in vicinity of TH 52 Interchange 2

Circle Drive
ACCESS MANAGEMENT PLAN

Segment 5

Alternatives for further Evaluation

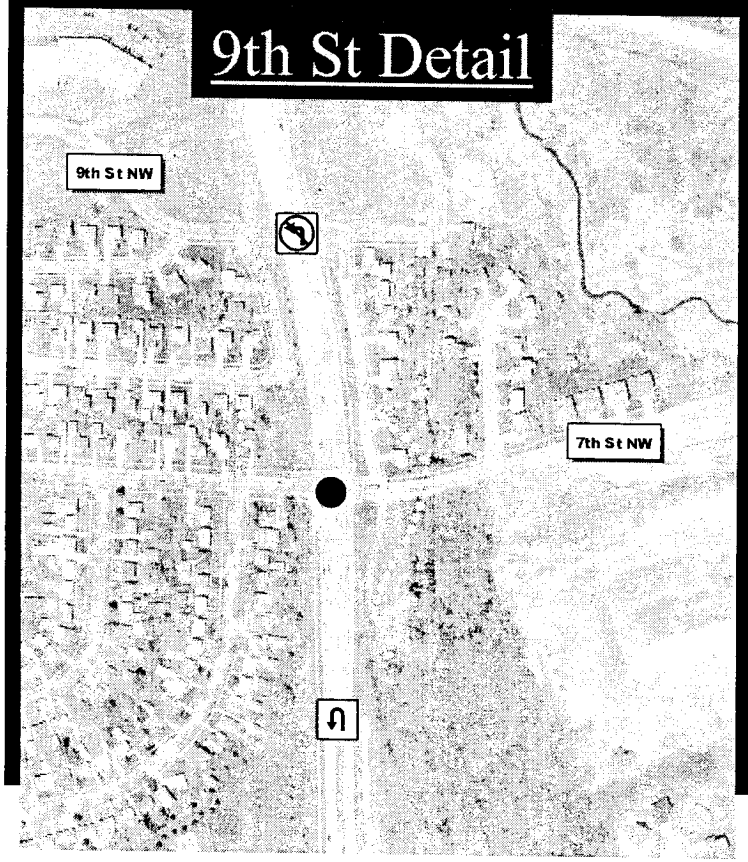
Also evaluate usefulness of alternative left turn treatments such as Michigan U-Turn

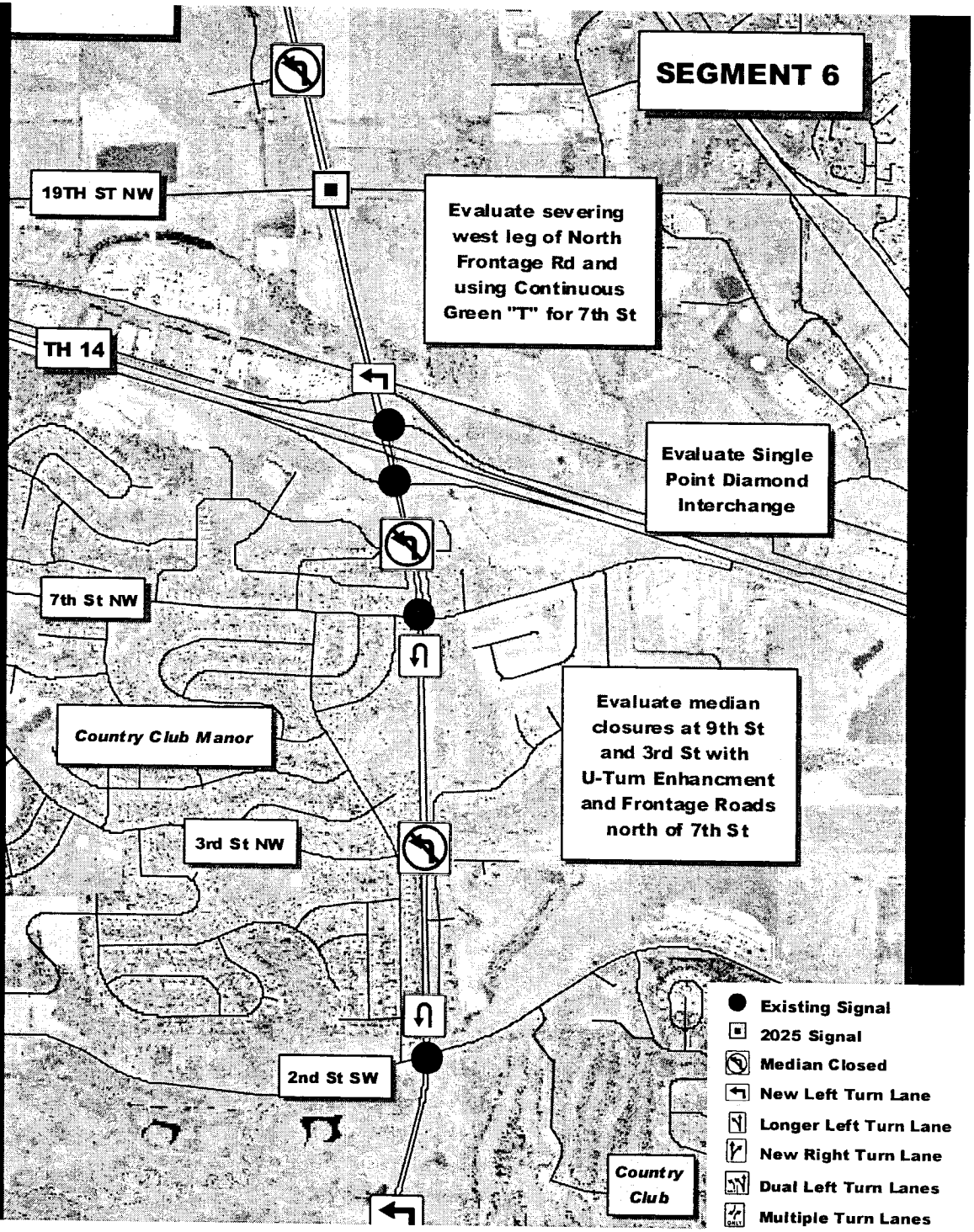


Circle Drive
ACCESS MANAGEMENT PLAN

Segment 6

Alternatives for further Evaluation





Circle Drive
ACCESS MANAGEMENT PLAN

Segment 7

Alternatives for further Evaluation

Investigate methods for improving side street left turns at unsignalized intersections